Enhancing the Li/Na-Ion Battery Performances by Order/Disorder Engineering

An invited talk

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Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

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Further enhancement of the performances of Li/Na ion batteries (LNB) is challenging when using the existing technical approaches. Therefore, we have chosen a different route, i.e., the disorder/ordering engineering to fabricate high performance cathodes/anodes/electrolytes, and this route could be potentially important for developing full solid batteries or full glass/glass ceramic batteries. The disorder/order engineering concept refers to the following aspects. The disordered or amorphous structure in cathode/anode materials is created via sol-gel or biotemplating or melt-quenching or ball-milling, and afterwards the ordered nano-domains in the disordered matrix phase are generated through heat-treatment and the newly discovered Li-ion intercalation/extraction induced nucleation. Conversely, long-range order solids are transformed into disordered or amorphous ones by ball-milling or by the newly discovered Li-ion discharging/charging induced amorphisation, and thereby enhancing ionic/electronic conductivities. In this talk, we present two case studies, which deal with cathodes and anodes concerning the effect of the order/disorder tuning on the electrochemical performances of Li/Na-ion batteries.

References

1. X.D. Zhang, Z.Y. Bi, W. He, G. Yang, H. Liu, Y.Z. Yue, Fabricating high-energy quantum dots in ultra-thin $LiFePO_4$ nanosheet using a multifunctional high-energy biomolecule – ATP. ***Energy & Environmental Science*** 7 (2014) 2285–2294.
2. W. He, X.D. Zhang, C. Jin, Y.Y. Wang, S. Mossin, Y.Z. Yue, Nano-glass ceramic cathodes for Li^+/Na^+ mixed-ion batteries. ***Journal of Power Sources*** 342 (2017) 717-725.
3. Y.F. Zhang, P.X. Wang, T. Zheng, D.M. Li, G.D. Li, Y.Z. Yue, Enhancing Li-ion battery anode performances via disorder/order engineering, ***Nano Energy*** 49 (2018) 596-602.
4. Y. F. Zhang, P. X. Wang, G. D. Li, J. H. Fan, C. W. Gao, Z. Y. Wang and Y. Z. Yue, Clarifying the charging induced nucleation in glass anode of Li-ion batteries and its enhanced performances, ***Nano Energy*** 57 (2019) 592-599.
5. F. Y. Xiong, Q. Y. An, L. X. Xia, Y. Zhao, L. Q. Mai, H. Z. Tao and Y. Z. Yue, Revealing the atomistic origin of the disorder-enhanced Na-storage performance in NaFePO4 battery cathode, ***Nano Energy*** 57 (2019) 608-615.